SMITHSONIAN MISCELLANEOUS COLLECTIONS
VOLUME 140, NO. 2

Charles D. and Mary Vaux Walcott
Research Fund

PLEISTOCENE BIRDS IN BERMUDA

(With Three Plates)

By
ALEXANDER WETMORE
Research Associate
Smithsonian Institution

(Publication 4423)

CITY OF WASHINGTON
PUBLISHED BY THE SMITHSONIAN INSTITUTION
JULY 7, 1960

THE LORD BALTIMORE PRESS, INC.
BALTIMORE, MD., U. S. A.

Charles D. and Mary Vaux Walcott Research Fund

PLEISTOCENE BIRDS IN BERMUDA

By ALEXANDER WETMORE
Research Associate, Smithsonian Institution

(With Three Plates)

In July 1956, Dr. David Nicol, then Associate Curator of Invertebrate Paleontology and Paleobotany in the U. S. National Museum, visited Bermuda to collect mollusks and other material, traveling under funds supplied by the National Science Foundation and the Walcott Fund of the Smithsonian Institution. On July 21 he worked in a Quaternary fossil deposit in the H. Bernard Wilkinson Quarry, south and west of Coney Island, Hamilton Parish, Bermuda. At this site, which is one that had been located by Dr. Heinz Lowenstam of the California Institute of Technology during his studies of the geology of the islands, in addition to fossil mollusks Dr. Nicol collected 30 fragments of bones of birds. Among these there were parts of a crane-like bird, unlike any living species, and wholly unexpected from this island locality.

In view of the importance of this discovery, Dr. W. H. Sutcliffe, Jr., Director of the Bermuda Biological Station, kindly arranged to have a further collection made for me in the cave where the first specimens had been obtained. Subsequently, in 1958, agreement was made with David B. Wingate to make a search for further avian material.

The bones, with quantities of shells of land mollusks, were imbedded in a calcareous tufa, fairly soft in texture, so that they were cleaned without particular difficulty. Their preservation is unusual as, in many, lines of muscle attachment and the most delicate processes are intact. Some of the specimens, in fact, are as perfect as the corresponding parts in the modern skeletons with which they have been compared.

The actual age of such deposits on Bermuda may be established by the detailed geological studies that Dr. Lowenstam has had underway. It is certain that they are old, and for the present it is my assumption

that they date back to the Pleistocene. The land area available at Bermuda during the lowest sea level of Pleistocene time was limited, as beyond the present shallow banks that surround the islands the bottom falls off steeply to a considerable depth.

Occurrence of the Bermuda petrel, the cahow of the early settlers, in Pleistocene time is not to be classed as unusual, but the crane and the duck present interesting records which indicate that the peculiarities of the avifaunas of the Pleistocene known in the West Indies (including the Bahama Islands) extended also to the remote Bermudas.

Drawings illustrating the specimens have been made by Lawrence B. Isham.

Family PROCELLARIIDAE, Shearwaters, Fulmars

PTERODROMA CAHOW (Nichols and Mowbray): Bermuda Petrel

Aestrelata cahow Nichols and Mowbray, Auk, vol. 33, No. 2, April (March 31), 1916, p. 194. (Southeast side of Castle Island, Bermuda.)

The numerous bones in the deposit indicate that the cahow was as abundant in this period of the Pleistocene as it was in the early days of colonists who settled on Bermuda. The material, which is rather fragmentary, includes representation of the humerus, ulna, carpometacarpus, furcula, coracoid, femur, tibiotarsus, and tarsometatarsus. These do not differ from modern specimens in the collections of the United States National Museum.

Family ANATIDAE, Swans, Geese, Ducks

ANAS PACHYSCELUS sp. nov.

(Pl. 1, figs. 1-5)

Holotype.—Left tarsometatarsus, U.S.N.M. No. 22506, complete except for part of talon, from H. Bernard Wilkinson Quarry, south and west of Coney Island, Hamilton Parish, Bermuda.

Characters.—Tarsometatarsus similar in general form to that of modern *Anas bahamensis* Linnaeus; size decidedly larger, being equal in length to that of male *Anas platyrhynchos,* with the shaft more robust than in the nominate race of that species; central line of the two that mark the attachment of the tibialis anticus extended distally for half its length below the lower end of the outer line; posterior face of upper end of shaft with a shallow, well-marked sulcus extending past base of inner side of talon; trochleae relatively broader and heavier.

The collection contains four nearly entire tarsometatarsi in addition to the type, with four proximal and three distal ends of others.

Tibiotarsus.—Fragments of this element include parts of 9 anterior and 16 posterior ends. The more robust have the head, the shaft, and the condyles, particularly the outer one, somewhat heavier than in larger individuals of male *platyrhynchos,* though the fibular crest is shorter. The range in size is that normal in individual and sexual differences.

Femur.—This bone is represented by 6 that are nearly complete, with 12 other parts from either end. Four others, all but one complete, come from ducklings from two-thirds grown to nearly full size. The material shows the usual size variation found in ducks of the subfamily Anatinae. The fossil bones as a whole indicate heavier form, but slightly shorter length, in comparison with a similar series of *A. platyrhynchos.* The more robust size is evident in the proximal end, and at the center of the lower surface of the shaft which is more broadly rounded, less angular. The popliteal area appears broader.

Humerus.—Six nearly complete bones, and 20 fragments are referred to this species. In form these are quite uniform, with the differences in size those common between male and female. However, it is to be noted that the larger group, presumed to come from male individuals, have the dimensions of female *Anas platyrhynchos,* and are thus definitely smaller than that species. The head of the bone is reduced in size, and is less undercut on the anconal aspect, so that there is no overhang above the upper end of the shaft. The external outline of the deltoid crest is more rounded, less angular, and the external tuberosity, viewed from the upper side, is supported on a narrower base. The elevated line of the attachment of the latissimus dorsi anterioris is decidedly shortened, but at the same time is produced as a sharp ridge that is more prominent than in any of the modern species of ducks that I have seen. At the distal end the external condyle is reduced, and the brachial depression is shallower, with less definite outline.

The impression from these comparisons is that the bird was one of sedentary habit and weakened powers of flight compared to the strong-flying, living species with which it has been compared. In support of this supposition I find that the humerus of this fossil species of Bermuda, in those points in which differences have been described above, agrees rather closely with the same bone in living *Anas laysanensis* Rothschild, which lives around the lagoon on Laysan Island in the Hawaiian Wildlife Refuge, where it is completely sedentary.

Ulna.—The two nearly complete bones show the amount of difference in size common to male and female in living species in their group. There are 12 additional fragments. These show that the middle section of the wing is decidedly shortened, the larger of the two complete specimens being definitely less than in the female of *Anas platyrhynchos.* It is interesting also to observe that the two lines of papillae for feather attachment have slight development of the series on the anconal side, which are prominent in birds of strong flight.

The two fragments of the radius seen are too small to give useful points for comparison.

Carpometacarpus.—This is represented by 1 complete bone, 3 others with the main shaft of metacarpal III missing, and 12 additional fragments. The complete elements show the slight differences in size that are considered to be due to sex, since they correspond to this distinction in living Anatinae. Compared to *Anas platyrhynchos,* the longer fossil bones, presumed to be male, are equivalent in length to the female of the living bird. The reduction in length seems to have come in the shafts of metacarpals II and III, as the proximal and distal ends are equal in size to those of the living species. The fossil carpometacarpus has its principal peculiarity in a pronounced constriction of the anterior end of the shaft of metacarpal III, which at first glance is somewhat confusing as its suggests the form found in the diving ducks. The other contours of the entire bone however are those of species of the Anatinae.

The slight differences described are those to be anticipated in a species of reduced flight.

Coracoid.—Ten bones nearly complete and nine fragments illustrate the characters of this bone. The element as a whole is definitely weaker than in the living mallard, as the length is slightly shorter, and the entire bone is less robust. This is noted in the reduction in the brachial tuberosity, the smaller glenoid facet, and the shortened procoracoid, in the head, and in the narrower sternal facet at the opposite end. Only in the coraco-humeral surface is there no noticeable difference.

Scapula.—The proximal sections of eight scapulae serve to indicate slightly smaller size and relatively more slender shaft, compared to *Anas platyrhynchos.*

Miscellaneous.—Additional parts of the skeleton include five fragments of the synsacrum, which resemble the similar part in other Anatinae, and are slightly smaller than those of the mallard.

Basal phalanges of three anterior toes equal in size those of male *Anas platyrhynchos,* so that the foot was large.

Discussion.—In this examination of the available parts of the skeleton, comparisons have been made with the modern mallard, *Anas platyrhynchos* Linnaeus, as the type species of the genus. In summary, the fossil appears to have been a species with the body size of a medium or small mallard, but with heavier legs, and definitely smaller wings. It seems, therefore, to have been a sedentary bird, active in swimming and walking, but with slight necessity for prolonged use of the wings, since so far as known it had no resident predators. The general condition resembles what I found in study of the living Laysan duck, *Anas laysanensis* Rothschild, restricted to tiny Laysan, an island in the Hawaiian Wildlife Reservation that is only one and three-quarters miles in length. The ducks are restricted to the central salt-water lake where they range mainly around freshwater seepages along the lagoon shore. When I approached they waddled slowly away, and took to wing rather heavily only when hard pressed. On Laysan, as on the Bermudas, there are no active predators so that strength in escape flight was not required. Some of the ducks flew fairly well over the lagoon, but others were exhausted after a flight of 125 yards so that I ran them down on foot and caught them by hand. It may be thought that the Bermuda duck was of similar habit.

The osteological differences that separate the fossil from living Anatinae are considerable, and may warrant its designation in a distinct genus, particularly since it appears to have no close relatives, either living or fossil. Most of the fossil ducks that may be related have been described from fragmentary bones, so that their full characters are unknown. Because of this it has seemed best for the present to treat the bird of Bermuda as a species of the genus *Anas* in the broad sense, at least until the osteology of all of the living kinds included in the subfamily is more fully known.

MEASUREMENTS OF *Anas pachyscelus* (IN MILLIMETERS)

Tarsometatarsus:

Length, 44.5, 44.9, 45.6, 45.7, 45.7, 45.8, 45.9, 45.9, 46.0, 46.2, 46.2, 48.2.

Transverse breadth of anterior end, 9.5, 10.0, 10.1, 10.1, 10.2, 10.2, 10.5.

Transverse breadth of shaft near center, 4.4, 4.5, 4.5, 4.6, 4.7, 4.7, 4.7, 4.9, 5.0, 5.1, 5.2, 5.3, 5.3.

Transverse breadth of distal end, 10.8, 10.8, 10.9, 10.9, 11.1, 11.3, 11.5, 11.8.

Tibiotarsus:

Smallest transverse breadth of shaft, 3.8, 4.0, 4.2, 4.3, 4.3, 4.4, 4.4, 4.5, 4.5, 4.5, 4.6, 4.6, 4.7, 4.7, 4.7.

Transverse breadth across condyles, 9.1, 9.1, 9.2, 9.2, 9.3, 9.3, 9.4, 9.4, 9.7, 9.9.

Femur:

Length, 48.0, 48.6, 52.3, 52.3, 52.4.

Transverse breadth through head, 11.6, 12.0, 12.2, 12.6, 12.8.

Transverse breadth near center of shaft, 4.6, 4.7, 4.8, 4.9, 4.9, 5.0, 5.1, 5.3, 5.3, 5.3, 5.3, 5.4, 5.4, 5.4, 5.6, 5.6, 5.6.

Transverse breadth through condyles, 11.2, 11.6, 12.0, 12.1, 12.5, 12.5, 12.6, 12.7, 12.8, 13.4.

Humerus:

Length, 83.8, 85.6, 87.5, 88.7, 90.1, 90.2.

Transverse diameter of proximal end, 19.3, 19.6, 19.7, 19.8, 19.8, 21.0.

Transverse diameter near center of shaft, 6.6, 6.8, 6.9, 7.0, 7.1, 7.3, 7.4, 7.5, 7.5, 7.7.

Transverse diameter through condyles, 13.3, 13.5, 13.6, 14.0, 14.4, 14.4, 14.4, 14.6.

Ulna:

Length, 68.9, 74.5.

Carpometacarpus:

Length, 53.6, 53.8, 54.2, 54.4, 58.0.

Height through metacarpal I, 12.5, 12.7, 12.8, 12.8, 13.0, 13.2, 13.7.

Length of intermetacarpal space, 27.7, 28.7, 29.5, 31.9.

Coracoid:

Length from head to internal distal angle, 47.9, 48.2, 49.8, 49.8, 49.9.

Smallest transverse diameter of shaft, 5.0, 5.0, 5.0, 5.1, 5.1, 5.2, 5.2, 5.3, 5.3, 5.6, 5.6, 5.8, 6.0, 6.1.

Family GRUIDAE, Cranes

BAEOPTERYX gen. nov.

Characters.—Differs from *Grus* Pallas, 1766, in form of the bones of the wing: Humerus with the head relatively narrower, the deltoid crest reduced in length, with considerably restricted area for muscle attachment; distal end with the points for tendinal attachment much weakened, and the processes in general relatively reduced in size; carpometacarpus with the bulk and strength found in modern *Grus canadensis* (Linnaeus), but length decidedly less; ulna with points for attachment of tendon and muscle reduced.

The type is *Baeopteryx latipes* sp. nov.

BAEOPTERYX LATIPES sp. nov.

(Pl. 2, figs. 1, 2; pl. 3, figs. 1-3)

Holotype.—U.S.N.M. No. 22505, right tarsometatarsus, from H. Bernard Wilkinson Quarry, south and west of Coney Island, Hamilton Parish, Bermuda.

Characters.—Tarsometatarsus similar to that of modern *Grus canadensis* (Linnaeus), but relatively heavier; shorter than in the small

subspecies *Grus canadensis canadensis,* but entire bone broader and stronger, with the distal end larger; trochlea for digit 2 larger; trochlea for digit 4 broader, with distal articular surface shorter; facet for articulation of digit 1 broader and larger.

The material at hand includes several broken tarsometatarsi as follows: Right side, proximal end 9, distal end 3; left side, proximal end 6, distal end 6; and 7 fragments from the central section of the shaft. These show agreement with the type in the characters noted.

Pedal phalanges.—These, part for part, are heavy compared to those of *Grus canadensis,* and so support the supposition of a stronger foot.

Tibiotarsus.—This segment is represented by fragments as follows: Right side, proximal end 8, distal end 5; left side, proximal end 6, distal end 3; and 8 sections from the central part of the shaft. The bone is strong, though it appears less heavy proportionately than the tarsometatarsus. Its main peculiarity is found in the tubercle that projects at the outer side of the lower end of the tendinal bridge which is narrow, somewhat elongated, and more smoothly rounded than in the modern cranes. Other parts of this bone, particularly of the proximal end, are too poorly preserved to offer characters useful in comparison.

Fibula.—One, nearly entire, appears relatively large, thus indicating the greater proportionate size of the leg.

Femur.—There are two nearly perfect; four fragments from the right side, and seven fragments from the left. Compared to *Grus canadensis* these are short and relatively heavy, with the internal condyle especially strong, and extended farther (downward). When the bone is viewed from the distal end the upper margin of the intercondylar fossa is more abruptly and more deeply grooved on the inner side. In the points of difference indicated the fossil is generally more similar to the much larger modern *Anthropoïdes paradisaea* (Lichtenstein) than to *Grus canadensis.*

Humerus.—This is represented by proximal and distal ends, and part of the shaft of another specimen, all from the right side. The bone, relatively, is small in size, with the head narrowed and the deltoid crest much reduced both in length and in the area of muscle attachment. The proximal end as a whole, compared with that of living cranes, is reduced, this feature including the upper section of the shaft. The line of insertion of the latissimus dorsi is strongly marked, the pneumatic opening, elevated in the usual position, is rather small, and the lower external margin of the bicipital crest is sharply angular. The reduction in size is evident also on the distal

end of the bone, where the tendinal attachments are weakened, a condition noted in the scar for the pronator brevis, in the flattened face of the entepicondylar prominence, and in the area of the ectepicondyle.

The form of the humerus as a whole is definitely that of a bird of reduced volant ability, notable particularly in a group of birds whose living species are strong in flight.

Ulna.—The material includes six proximal and six distal ends, with two additional segments of the shaft. These fragments corroborate the character of humerus and carpometacarpus in evident reduction in size. In addition the impression for the brachialis anticus, and the development of the other parts of the head are less in size and strength, characters that are repeated in relative form at the distal articulation. Though the reduction is less marked than in the wing elements on either side the indication is that of lesser power. The weakened papillae for attachment of the secondaries in particular give this impression. As the material is fragmentary, no definite measurement of the total length is available.

Radius.—The only part preserved is a section from the distal end, which indicates a reduction in size with a definite flattening of the shaft.

Carpometacarpus.—The eight specimens, three from the right side and five from the left, show the characters of this bone fully (except for the distal half of metacarpal III which is missing), and verify fully the supposition of reduction in powers of flight in this interesting species. The bone as a whole retains the bulk and strength found in living *Grus canadensis* but is only four-fifths as long. This shortened length has come in the distal area as the proximal end is as large as in the modern species with the parts of equal size and development. The reduction is evident particularly in the length of the shaft between the head of the bone and the proximal end of the intermetacarpal opening, and in length from the opposite end of the same open space and the distal margin of the bone, this being only half the length of the modern bird.

Second digit of first phalanx.—The single complete bone is about one-third shorter than in small *Grus canadensis,* though it is nearly as high in its central area. The details of form otherwise are like those in the larger bird.

The lessened length is another indication of the shortened wing.

Coracoid.—One nearly complete bone and three fragments indicate clearly a considerable reduction in size in this area of the skeleton.

The one nearly entire is shorter than a small specimen of the smallest of the living subspecies of *Grus canadensis,* and is decidedly less in size of shaft and in extent of the broadened end that articulates with the sternum. A size one-fourth less at least is demonstrated, which by analogy would be found likewise in the sternum. The smaller dimension would affect the size of the breast muscle, so that the coracoid is further indication of lessened ability in flight.

Scapula.—The articular ends of several show no details of significant difference.

Vertebrae.—Several that are nearly complete are of the type usual in cranes.

Skull.—The few fragments consist of the end of one premaxilla with the tip broken, three symphyses of the mandible with the tips missing, and the articular, and immediately adjacent, parts from the left side of the lower jaw. The robust size of these is surprising as they are equal to the larger subspecies of the brown crane *Grus canadensis tabida,* while the other dimensions in the skeleton, except for the heavy foot, are generally less than those of the smaller race *Grus canadensis canadensis.*

Remarks.—The material of this species is sufficient to give a general outline of the form of the bird, which is seen to be somewhat less in stature than the smaller race of the living sandhill crane *Grus canadensis canadensis,* though coupled with this is a shorter wing, a heavier leg, seen particularly in the foot, and a larger head.

A survey of the species of the family Gruidae that have been recognized in fossil form indicates only two that require brief comment. *Grus conferta* Miller and Sibley from the late lower Pliocene of California, recorded from the distal end of a tarsometatarsus, is a much larger bird than *Baeopteryx latipes,* as the type specimen has the size of the modern whooping crane *Grus americana.* Another species from the middle Pliocene of Kansas, *Grus nannodes* Wetmore and Martin, described from a carpometacarpus, perhaps had about the same body size as the species from Bermuda, but agrees in form of the type bone with *Grus canadensis* and thus is different.

The weakened wing structure of the Bermudan species, indicative of considerably reduced power of flight, is so different from that of modern cranes as to justify separation in a genus distinct from *Grus.* The name *Baeopteryx* is taken from the Greek *βαιός,* small and *πτερυξ,* wing. The specific name is from the Latin *latus,* broad, and *pes,* foot.

MEASUREMENTS OF *Baeopteryx latipes* (IN MILLIMETERS)

Tarsometatarsus:
Length, 184.
Transverse breadth of anterior end, 22.6, 22.6, 23.5, 23.6, 23.9.
Transverse breadth of shaft near center, 8.0, 8.0, 8.3, 8.3, 8.5, 8.6, 8.8, 9.1.
Transverse breadth of distal end, 20.4, 20.8, 22.4, 22.7.
Tibiotarsus:
Smallest transverse breadth of shaft near distal end, 9.9, 9.9, 10.4, 10.5.
Transverse breadth across condyles, 19.1, 19.8, 20.2, 20.9, 21.0, 21.5.
Femur:
Length to distal end of internal condyle, 98.2, 100.8.
Transverse breadth through head, 23.0, 23.7, 24.3, 24.8.
Transverse breadth near center of shaft, 10.2, 10.5, 10.7, 11.0, 11.0, 11.4, 11.5.
Transverse breadth through condyles, 22.0, 22.2, 23.2, 23.7.
First phalanx of third toe:
Length, 29.0, 29.4, 29.8, 31.6.
Humerus:
Transverse diameter of proximal end, 33.5.
Transverse diameter near center of shaft, 12.4, 13.1, 13.4.
Transverse diameter through condyles, 25.6.
Carpometacarpus:
Length, 79.0, 79.7, 79.9, 80.1.
Vertical height through metacarpal I, 20.3, 20.5, 20.8, 21.1, 21.3, 21.6.
Length of intermetacarpal space, 41.5, 42.0, 42.6, 43.8, 44.6.
First phalanx of digit 2:
Length, 34.7.
Vertical height near center, 11.3.
Coracoid:
Length, from head to inner distal angle, 54.0.
Transverse width of shaft at narrowest point, 10.0

Family RALLIDAE: Rails

The collection contains various bones from four species of rails, one very small, two of intermediate size, and one nearly as large as the modern clapper rail. These are not clearly marked in the present collection so that no attempt is made to describe them here in detail, particularly since complete material for one of them is now in other hands for study.

EXPLANATION OF PLATES

Plate 1

Leg and wing bones of a duck, *Anas pachyscelus,* from the Bermuda Pleistocene

Fig. 1. Palmar and anconal views of right humerus, natural size.
Fig. 2. Outline views of left femur, natural size.
Fig. 3. Left tarsometatarsus (type), natural size.
Fig. 4. Left coracoid, natural size.
Fig. 5. Right carpometacarpus, natural size.

Plate 2

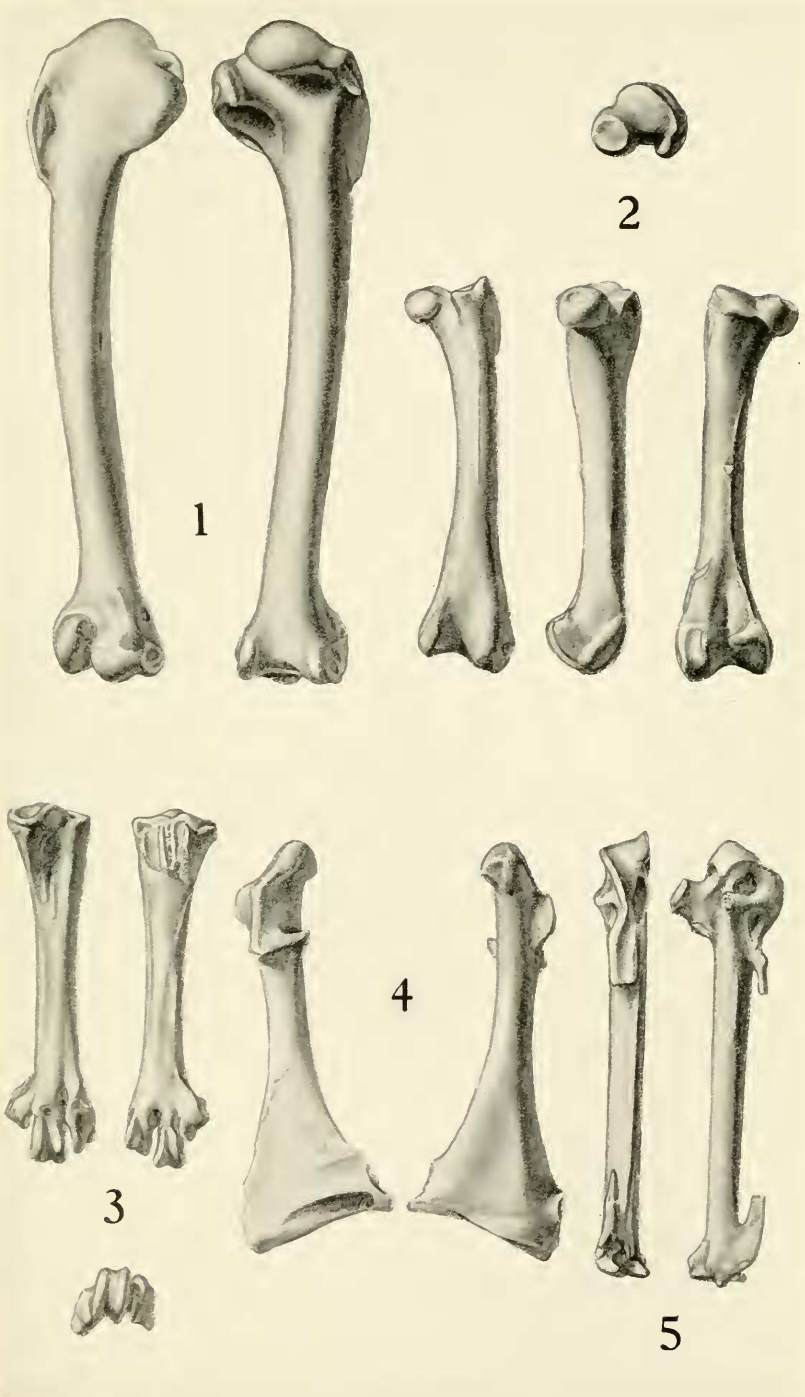
Leg bones of a crane, *Baeopteryx latipes,* from the Bermuda Pleistocene

Fig. 1. Right tarsometatarsus (type), natural size.
Fig. 2. Femur, natural size.

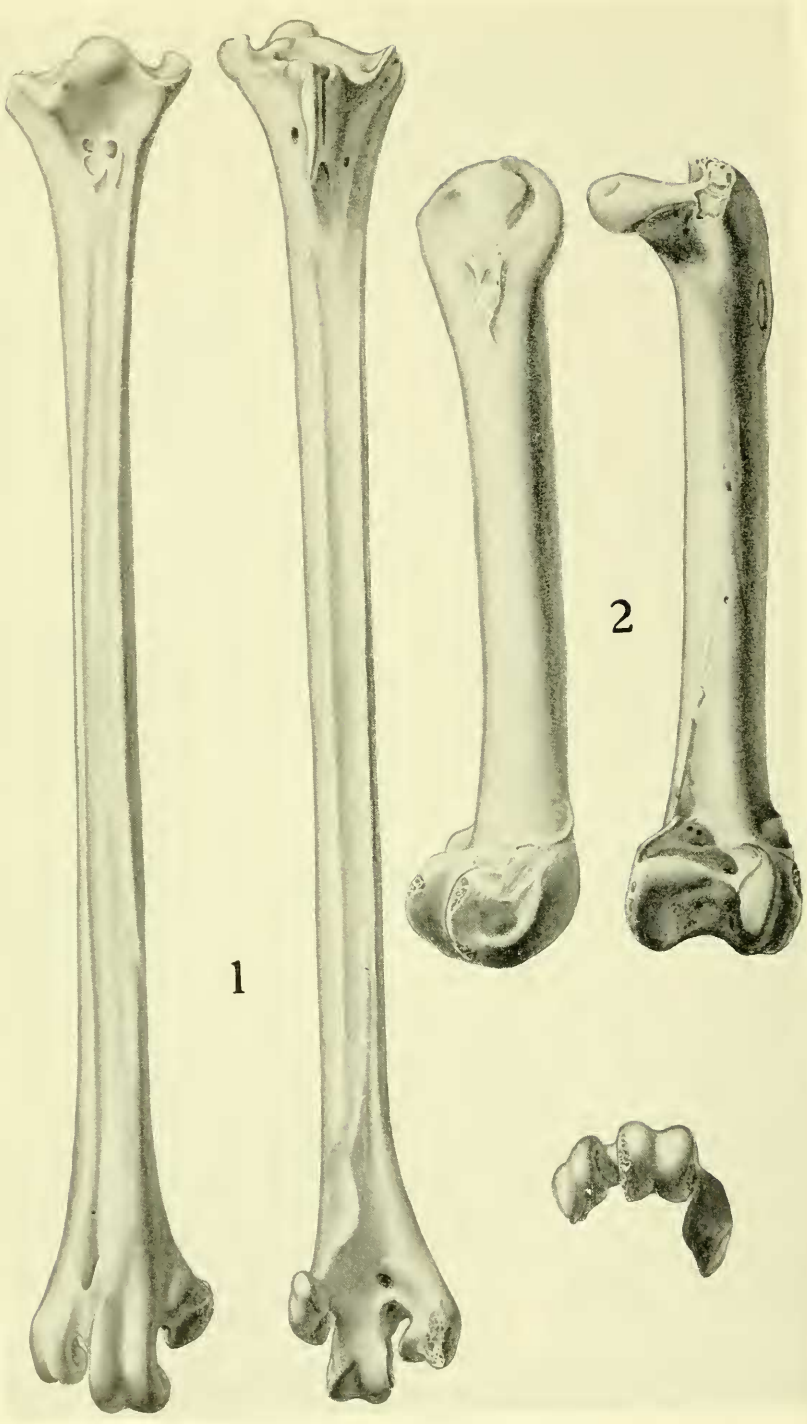
Plate 3

Wing bones of a crane, *Baeopteryx latipes,* from the Bermuda Pleistocene

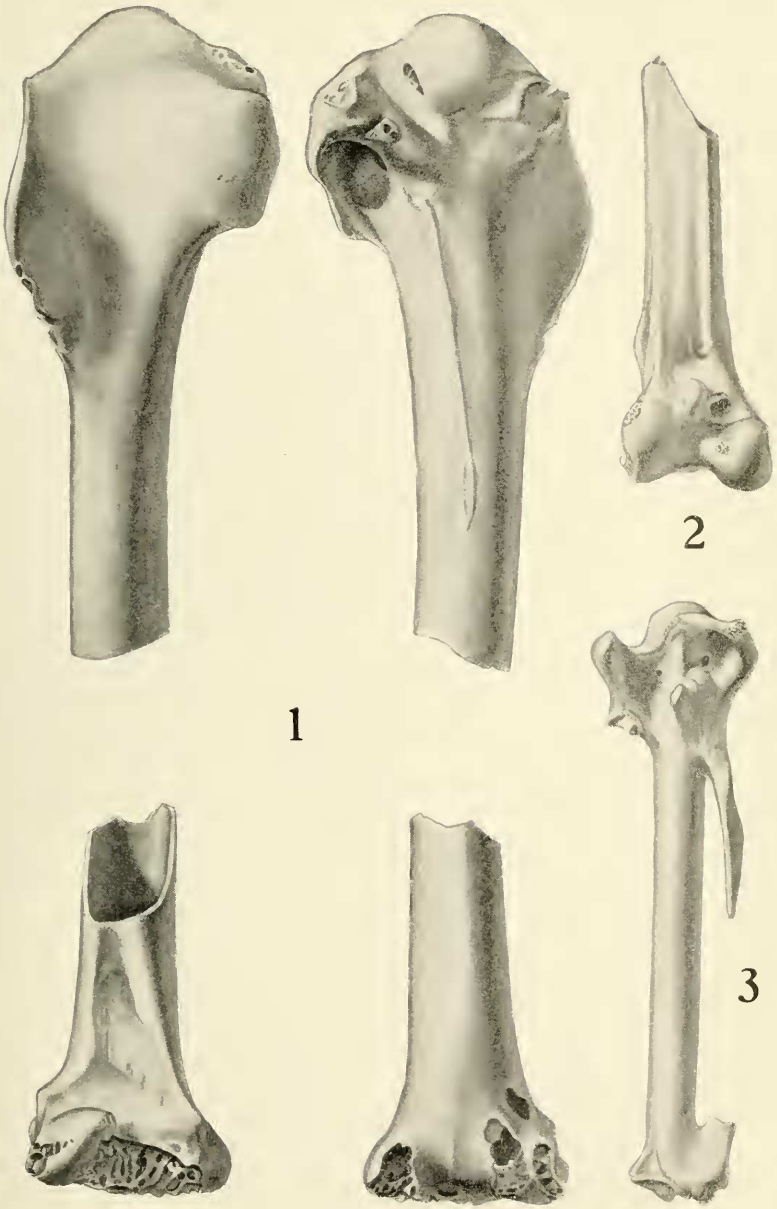
Fig. 1. Humerus, natural size.
Fig. 2. Distal end of tibiotarsus, natural size.
Fig. 3. Carpometacarpus, natural size.



(See explanation of plate at end of text.)



(See explanation of plate at end of text.)



(See explanation of plate at end of text.)